

1. (Amended) An exposure apparatus, comprising:

an illumination optical system for illuminating an original with an F₂ excimer laser;

a projection optical system for projecting a pattern of the original onto a substrate to be exposed;

gas purging means for replacing a gas in an inside space, which accommodates optical components of at least one of said illumination optical system and said projection optical system, with a dry gas;

a hygrometer, disposed in the inside space, for measuring conditions in the inside space and for producing an output; and

a controller for controlling said gas purging means on the basis of the output of said hygrometer.

4. An apparatus according to Claim 1, wherein the dry gas consists of one of N₂ gas, He gas and dry air.

5. An apparatus according to Claim 1, further comprising passage means, mutually communicating spaces separated by said optical components, for assisting in gas purging by said gas purging means.

6. (Amended) An exposure apparatus, comprising:

an illumination optical system for illuminating an original with ultraviolet light;

a projection optical system for projecting a pattern of the original onto a substrate to be exposed;

gas purging means for replacing a gas in an inside space, which contains optical components of at least one of said illumination optical system and said projection optical system, with a particular gas;

passage means, mutually communicating spaces separated by said optical components, for assisting in gas purging by said gas purging means; and

supports for supporting said optical components,

wherein said passage means comprises apertures formed in said supports or said optical components, and

wherein a straight line connecting apertures of a pair of adjacent supports of said passage means is not parallel to a plane defined by an optical axis of a lens which is one of the optical components and a straight line connecting apertures of another pair of adjacent supports.

7. An apparatus according to Claim 6, wherein the particular gas consists of an inert gas.

9. (Amended) An exposure apparatus comprising:

an illumination optical system for illuminating an original with ultraviolet light;

a projection optical system for projecting a pattern of the original onto a substrate to be exposed;

gas purging means for replacing a gas in an inside space, which contains optical components of at least one of said illumination optical system and said projection optical system, with a particular gas, said optical components comprising at least one lens; and

passage means, mutually communicating spaces separated by said optical components, for assisting in gas purging by said gas purging means, wherein said passage means comprises a notch provided on said at least one lens.

11. An apparatus according to Claim 1 or 6, further comprising a path defined within the space for allowing gas to flow from a gas inlet to a gas outlet, for assisting in gas purging by said gas purging means.

12. An apparatus according to Claim 6, further comprising a light source that includes an F_2 excimer laser.

14. (Amended) An exposure apparatus, comprising:

an illumination optical system for illuminating an original;

a projection optical system for projecting a pattern of the original onto a substrate to be exposed;

gas purging means for replacing, with a particular gas, a gas in an inside space which contains optical components of at least one of said illumination optical system and said projection optical system, said optical components comprising at least one lens; and

a plurality of passage means, mutually communicating spaces separated by said optical components, for assisting in gas purging by said gas purging means,

wherein a straight line connecting an adjacent pair of said plurality of passage means provided in a same casing for gas purging, is not parallel to an optical axis of said at least one lens and a straight line connecting another pair of said plurality of passage means, which is one of the optical components.

15. A device manufacturing method, comprising:

illuminating an original with an F_2 excimer laser using an illumination optical system;

projecting, using a projection optical system, a pattern of the original onto a substrate to be exposed to manufacture a device;

replacing, using gas purging means, an inside space, which accommodates optical components of at least one of the illumination optical system and the projection optical system, with a dry gas;

measuring, using a hygrometer disposed in the inside space, conditions in the inside space and producing an output; and

controlling the dry gas replacement using the gas purging means, on the basis of the output of the hygrometer.

16. A device manufacturing method, comprising:

illuminating an original with ultraviolet light using an illumination optical system;

projecting, using a projection optical system, a pattern of the original onto a substrate to be exposed to manufacture a device;

replacing, using gas purging means, an inside space, which contains optical components of at least one of the illumination optical system and the projection optical system, with a particular gas, the optical components comprising at least one lens;

mutually communicating, using passage means, spaces separated by the optical components, for assisting in gas purging by the gas purging means; and

supporting the at least one lens using a support,

wherein the passage means comprises an aperture formed in the support and,

wherein a straight line connecting apertures of a pair of adjacent supports of said passage means is not parallel to a plane defined by an optical axis of a lens which is one of the optical components and a straight line connecting apertures of another pair of adjacent supports.

17. (Amended) A device manufacturing method, comprising:

illuminating an original with ultraviolet light using an illumination optical system;

projecting, using an illumination optical system, a pattern of the original onto a substrate to be exposed to manufacture a device;

replacing, using gas purging means, an inside space, which contains optical components of at least one of the illumination optical system and the projection optical system, with a particular gas, the optical components comprising at least one lens; and

mutually communicating, using passage means, spaces separated by the optical components, for assisting in gas purging by the gas purging means, the passage means including a notch provided on the at least one lens!

18. A device manufacturing method, comprising:

illuminating an original using an illumination optical system;

projecting, using a projection optical system, a pattern of the original onto a substrate to be exposed to manufacture a device;

replacing with a particular gas, using gas purging means, an inside space which contains optical components of at least one of the illumination optical system and the projection optical system, the optical components comprising at least one lens; and

mutually communicating, using a plurality of passage means, spaces separated by the optical components, for assisting in gas purging by the gas purging means,

wherein a straight line connecting an adjacent pair of said plurality of passage means provided in a same casing for gas purging, is not parallel to a plane defined by an optical axis of said at least one lens and a straight line connecting another adjacent pair of said plurality of passage means.

19. An apparatus according to Claim 9, wherein the particular gas consists of an inert gas.

20. An apparatus according to Claim 14, wherein the particular gas consists of an inert gas.

21. A method according to Claim 15, wherein the dry gas consists of one of N₂ gas, He gas and dry air.

22. A method according to Claim 16, wherein the particular gas consists of an inert gas.

23. A method according to Claim 17, wherein the particular gas consists of an inert gas.

24. A method according to Claim 18, wherein the particular gas consists of an inert gas.

Please ADD new claims 25-46 as follows:

— 25. An exposure apparatus comprising:

an optical system including an optical element having at least one aperture through which a gas can be transmitted.

26. An apparatus according to Claim 25, further comprising a plurality of optical components each having at least one aperture, wherein a straight line connecting apertures of adjacent optical elements is not parallel to any of optical axes of the adjacent optical elements and the straight line also does not intersect any of the optical axes of the adjacent optical elements.

27. An apparatus according to Claim 25, further comprising a plurality of optical elements each having at least one aperture, wherein a straight line connecting apertures of adjacent optical elements is not contained in any of planes including optical axes of the adjacent optical elements, respectively.

28. An apparatus according to Claim 25, further comprising a plurality of optical elements each having at least one aperture, wherein apertures of adjacent optical elements are disposed at rotational positions, about an optical axis of said optical system, with angles other than zero degree and 180 degrees.

29. An apparatus according to Claim 25, further comprising an illumination optical system for illuminating a reticle, wherein said illumination optical system includes said optical system.

30. An apparatus according to Claim 25, wherein said optical system includes plural optical elements each having plural apertures.

31. An exposure apparatus comprising:
an optical system having at least one optical element and including a supporting portion for supporting said at least one optical element, said supporting portion having a plurality of apertures through which a gas can flow.

32. An apparatus according to Claim 31, further comprising a plurality of optical elements each having a plurality of apertures, wherein a straight line connecting apertures of adjacent optical elements is not parallel to any of optical axes of the adjacent optical elements and the straight line also does not intersect any of the optical axes of the adjacent optical elements.

33. An apparatus according to Claim 31, further comprising a plurality of optical elements each having a plurality of apertures, wherein a straight line connecting apertures of adjacent optical elements is not contained in any of planes including optical axes of the adjacent optical elements, respectively.

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34. An apparatus according to Claim 31, further comprising a plurality of optical elements each having at least one aperture, wherein apertures of adjacent optical elements are disposed at rotational positions, about an optical axis of said optical system, with angles other than zero degree and 180 degrees.

35. An apparatus according to Claim 31, further comprising an illumination optical system for illuminating a reticle, wherein said illumination optical system includes said optical system.

36. An exposure apparatus comprising:

an optical system having a plurality of spaces separated by a plurality of separating portions each including an optical element and a supporting portion for supporting the optical element, wherein each of two adjacent separating portions of the plurality of separating portions has an aperture through which a gas can be transmitted, and wherein apertures of the adjacent two separating portions are disposed at rotational positions, about an optical axis of said optical system, with angles other than zero degree and 180 degrees.

37. An apparatus according to Claim 36, further comprising an illumination optical system for illuminating a reticle, wherein said illumination optical system includes said optical system.

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38. An exposure apparatus comprising:

an optical system having a plurality of spaces separated by a plurality of separating portions each including an optical element and a supporting portion for supporting the optical element, wherein each of two adjacent separating portions of the plurality of separating portions has an aperture through which a gas can be transmitted, and wherein a straight line connecting apertures of the adjacent two separating portions is not parallel to any of optical axes of optical elements of said adjacent two separating portions and the straight line also does not intersect any of the optical axes of the optical elements of the adjacent two separating portions.

39. An apparatus according to Claim 38, further comprising an illumination optical system for illuminating a reticle, wherein said illumination optical system includes said optical system.

40. An exposure apparatus comprising:

an optical system having a plurality of spaces separated by a plurality of separating portions each including an optical element and a supporting portion for supporting the optical element, wherein each of two adjacent separating portions of the plurality of separating portions has an aperture through which a gas can be transmitted, and wherein a straight line connecting apertures of the adjacent two separating portions is not contained in any of planes including optical axes of the optical elements of the adjacent two separating portions.

41. An apparatus according to Claim 40, further comprising an illumination optical system for illuminating a reticle, wherein said illumination optical system includes said optical system.

42. A device manufacturing method, comprising the steps of:
exposing a substrate by use of an exposure apparatus as recited in Claim 25;
and
etching the exposed substrate.

43. A device manufacturing method, comprising the steps of:
exposing a substrate by use of an exposure apparatus as recited in Claim 31;
and
etching the exposed substrate.

44. A device manufacturing method, comprising the steps of:
exposing a substrate by use of an exposure apparatus as recited in Claim 36;
and
etching the exposed substrate.